RESEARCH AND THE PREVENTION OF BLINDNESS

Sir Stewart Duke-Elder

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RESEARCH
AND THE
PREVENTION OF BLINDNESS

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RESEARCH AND THE PREVENTION OF BLINDNESS

FOREWORD

Sir Stewart Duke-Elder, amongst his many activities as one of the world's leading authorities on eye diseases, has, since the formation of our Society in 1949, been Chairman of our Panel of Medical Advisers. On his initiative the Society, in 1951, decided to promote medical surveys to ascertain the extent and causes of blindness in Africa. The largest of these surveys, that in West Africa which involved four years' joint action by an entomological and ophthalmological team, was the particular concern of the Society's Medical Advisers, and both in its planning and ultimate conclusions owed much to the wise counsel and unrivalled knowledge of Sir Stewart Duke-Elder. The report on the entomological aspect of this survey by Dr. Geoffrey Crisp has already been published with a foreword by Sir Stewart, who also wrote an introduction to a report by Dr. Calcott on the two years' survey undertaken in Kenya by the Kenya Society for the Blind. The ophthalmological report resulting from the West African survey is now with the printers and in the course of the next few months will be published with Sir Stewart's foreword.

The Society would like to express its gratitude to the Ophthalmic Research Institute of Australia which has supplied free these copies of Sir Stewart's oration with permission to distribute them to Societies for the Blind in the Commonwealth. It gives us this opportunity, which we greatly value, to express most cordial thanks to Sir Stewart Duke-Elder for the leadership, advice and guidance to which we, and many of the organisations with which we are affiliated abroad, owe so much.

Bernard Reilly
Chairman, Royal Commonwealth Society for the Blind.

July, 1958.

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Research and the Prevention of Blindness

Oration delivered by

SIR STEWART DUKE-ELDER, K.C.V.O.,

Surgeon-Oculist to the Queen,

on October 3rd, 1957,

in the Wilson Hall, University of Melbourne.

OPHTHALMIC RESEARCH INSTITUTE OF AUSTRALIA

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RESEARCH AND THE PREVENTION OF BLINDNESS

I have come to Australia partly, I must say, to see your great country of which I have heard so much, and to see Australians at home, many of whom—particularly your medical men in training in London—I have had the great privilege of knowing; and partly—and much more importantly—because it seems to me that you as a nation are about to start a new epoch of progress in the care of diseases of the eye and the prevention of blindness. Few things can be more important than this; and I have come to encourage you and—so far as I can—to help you. You are now starting a Research Institute for this purpose. You are taking steps to inaugurate a Chair in Ophthalmology in your University.

Already in Australia you have made notable and valuable contributions in the study of diseases of the eye. Already Australian ophthalmology is known and respected throughout the world. But these new happenings are important and exciting events full of possibilities for the future, events which can only be assessed in the light of the enthusiasm, the energy and the drive which characterises everything that is Australian. Up to now, by and large, you have derived most of your inspiration in things ophthalmological from London, from the old world centres of learning in Europe, and from the vigorous centres of research in America. From today onwards you are to stand on your own feet.

The same thing applied until a generation or two ago to the two great sister countries of the North American continent—the United States and Canada. For long Great Britain and Europe served as the nursery for the American eye-surgeon; to those countries he came in search of scholarship, knowledge and inspiration; from these countries for more than a century the ferment of progress, new techniques and research spread to North America. And today these two sister countries, called to the summit of the world by reason of their mass, their energy and their power, stand out in their own right as mighty forces in the progress of knowledge; and from their multitude of research institutes and university chairs they are paying back to us and to the whole world dividends for the knowledge we have given them which cannot be computed in value.

Now you are starting the same process in Australia, and appropriately in Melbourne. And we in London, who are factually and spiritually your parents, look with immense sympathy on your aspirations and will take an equal pride in your future achievements.

It would be easy in a lecture of this type to stress the emotional aspects of blindness. It would be easy to talk at length of the tragedy of the infant born without vision and denied throughout life the sight of the richness of the beauty of the world; or the greater tragedy of the adult from whom all this has been taken away in mid-life so that he becomes lost in perpetual darkness. To dilate on the disaster thus caused to the sufferer — and the equally great suffering and distress to his relatives or those with whom he shares his life—would, as I say, be easy; but my intention is rather different. It is to tell you how much of this tragedy is preventable; how much is potentially preventable; and how little is the cost thus entailed measured both in effort and in money compared with the heart-breaking social problem of caring for the blind, and the immense cost—both to the nation and to individuals—of supporting them financially, to which one must add the loss to the national productivity that their disability entails. The economic cost of blindness is a major problem, for, unlike the victims of diseases such as cancer, the blind do not die soon, but live on for many years, usually—but not always—a burden on others.

First of all, let me examine the size of the problem. Adopting the most practical definition of blindness—a loss of sight sufficient to prevent a person from seeing to get about or doing work for which eyesight is essential—the condition is much more common than is generally recognized. As a matter of fact, no accurate assessment of the number of blind people in the world is possible, and any estimations we may make are approximate and subject to a wide margin of error. Returns of any accuracy are obtainable from only a few of the more civilized countries in the world and are essentially confined to those which have an elaborate system of social subsidies. From large tracts of the world we have to depend on estimates, most of them based on samples of the populations, and from some countries no returns at all are available.

In England, in 1954, there were 93,622 registered blind people, that is, about 200 per 100,000 of the total population. In the U.S.A. the estimated number of blind for the year 1955 was

334,000. It would appear that in most advanced countries in Western Europe, in Australia and in America, the rate is about the same. In Eastern Europe and most of Asia the blindness rate is at least twice this, in China, with its population of over 500,000,000, three times this, in the Middle East and much of Africa from 6 to 10 times these figures. In our British Commonwealth there are about 3,000,000 blind. Altogether it may be safely assessed that in the world today there are 15 to 16 million blind persons; that is a lot, but this figure must be taken as a minimum. It is an estimate that errs on the conservative side.

These figures are difficult to appreciate. But imagine a city greater than the size of Cambridge in England or greater than Wollongong in Australia in which every man, woman and child was blind, and you get the English problem. Imagine a city the size of Miami in Florida or Perth in Australia over which the same tragedy brooded. Imagine a country the size of Canada—almost twice the size of Australia—in which not a single human being could see—and you get some measure of the world problem.

What are the CAUSES of all this world-wide tragedy? In this respect we can divide the world into two parts; the highly developed industrial countries (like Britain and Australia) and the others. The highly developed countries have a comparable blindness-rate—all round, about 200 in 100,000; in the less highly developed the incidence is twice to 10 times higher. For in them the same diseases occur as we ourselves suffer from, but, in addition, there is an immense total due to infective disease, dirt, squalor and dietary deficiency.

Let us take the highly organized and industrial countries first. In these, recent research and particularly the introduction of the modern antibiotic drugs which followed the discovery of penicillin have lessened the dangers of the infective diseases of the eye, while relatively highly developed medical facilities and their ready availability have reduced such diseases to almost negligible proportions. It is important to note that the availability of prompt medical aid is as important as its existence.

The story of how this happened is interesting and typical of how research on a small and modest scale has created a revolution in the lives of every one of us; how it has created a revolution in our social society, eliminating old problems only to introduce new ones; saving more lives and hundreds of millions more pounds that originally it cost in pennies. This may seem an extravagant thing to say; but it is true.

All the world knows how in 1929 Alexander Fleming in London observed by chance that the germs he was cultivating from the boils of patients ceased to grow and melted away because, as he demonstrated, a small quantity of a mould called penicillium, landed by chance upon his cultures. There the matter remained as an interesting observation until 1939 when, at the beginning of the Second World War, Florey and his research team at Oxford deliberately set about an investigation to determine the best drugs to use against infection in the expected holocaust of war casualties. Out of several choices which appeared of equal potential promise, again by chance—at the toss of a coin, as it were—they determined to investigate Fleming's penicillin. With a modest expenditure of time and money the properties of penicillin were established, its method of cultivation discovered, and a new era was inaugurated in the treatment of infective diseases.

The rest of the story is well known. From Oxford the results of the research were sent to the U.S.A. with the request that methods of mass manufacture should be evolved so that the new life-saving drugs should be available in quantity as the casualty lists mounted. And the Americans responded nobly—just as they did when the first radar apparatus was sent to the Massachusetts Institute of Technology and came back in quantity to protect us during the war; just as they did when the methods of atomic fission, conceived originally by Rutherford of Cambridge, came back as the atom bomb to end the war. And in the post-war years the immense pharmaceutical industry throughout the world has extracted from the soil other moulds and fungi, and their laboratories have synthesized other antibiotic drugs by the dozen, so that today most of the infective diseases caused by bacteria—not only the ordinary septic infections, but diseases such as pneumonia and meningitis, infections such as typhoid, typhus, tuberculosis and venereal diseases—have ceased to be a medical problem. Only the virus diseases have so far eluded control by this means. By and large, the young and fit have ceased to die of acute infections; the expectation of life has been increased to an astonishing degree; man now dies largely of cancer, heart disease and the degenerative conditions and socially the care of the aged, with their upkeep and pensions, is becoming one of the most serious problems of our civilization.

From the point of view of the eyes and blindness a similar revolution has occurred. The vast toll of sight taken by acute bacterial infections has been reduced to modest proportions where-ever skilled medical help is readily available. The position is perhaps most readily illustrated by the effects of venereal disease. When I was a young surgeon one of the commonest blinding diseases was syphilis, and hardly a day passed, and certainly a week never passed, wherein one did not see the sight of a young child gravely and permanently affected by an acute syphilitic infection acquired by hereditary or, almost as frequently, an adult incapacitated by atrophy of the optic nerves due to syphilis. At that time—only 30 years ago—we had a special hospital in London run solely for the treatment of newly-born infants suffering from gonorrhoeal infections acquired at or soon after birth; and in spite of the utmost care the vision of many of these was greatly impaired. Not infrequently the eye, perforated by a gonorrhoeal ulcer, burst and all vision was lost. That hospital has long since been closed, and today, in London, and I suppose in Melbourne, to see any of these ocular diseases is a rare event—so rare indeed, that we in London find difficulty in getting cases from which we can teach our students. Similarly in America admissions of children to schools for the blind from this cause fell from 28% in 1908 to 2% in 1949; today it is negligible.

The important points I would stress from this first story is the common sequence. A chance observation which most of us would let pass without comment but has been intelligently recorded; an organized research scheme run by trained workers that costs but little in financial backing; and then a complete revolution in the health of the community, the saving of more lives—and more eyes—than were ever lost in war since history began; a saving of more money and a gain in individual and national efficiency that cannot easily be measured.

The bacterial infections being thus under control, what are we left with? Again, we will still confine ourselves to an advanced industrial country like mine and yours. In these countries the great mass of blindness is due to 3 causes—the degenerative conditions that occur with age — essentially cataract, glaucoma and nerve degenerations; the congenital and hereditary affections among which the most prolific of visual disability is short sight; and injuries—domestic, agricultural or industrial.

The last can be easily dismissed—for it is almost entirely preventable. But at the same time in any assessment of blindness it should always be borne in mind. It is not often realized how serious, for example, are the injuries to the eyes sustained domestically at home. The types of injury thus sustained are legion; fortunately, most of them are trivial; but too many are serious. In Scotland, for example, it has been estimated that 43% of cases in which an eye had to be removed because of injury resulted from an accident in the home; and in America it has been calculated that 18% of all cases of blindness in one eye and 5% of all cases of blindness of both eyes due to all causes, or 25% of bilateral blindness due to accidents were the results of accidents in the home. In America it has been calculated that each year over 1,000 children lose the sight of at least one eye at play and games at school. Industrial injuries, however, are much more common and more serious economically. In Great Britain in factories alone some 10,000 accidents to the eyes, either mechanical or chemical, occur each year of sufficient severity to disable the workman for more than 3 days; to this we add a further 11,000 occurring in the mines. In the United States it is computed that 300,000 accidents to the eyes occur annually necessitating cessation of work for 1 day or more — that is, one accident every 30 seconds, or nearly 1,000 every 8-hour day throughout the year. It has also been computed that the average period of disability for an eye injury is 15 weeks in comparison with a period of 5 weeks for all accidents to other parts of the body, and that more eyes are lost from these accidents than are legs, arms, hands and feet combined.

The cost of all this holocaust which continues quietly and persistently day after day, year after year, is, of course, astronomical. The cost in human suffering and distress is great, the loss of efficiency and working time in a competitive industrial community is hardly credible, and the cost in money appalling. In this respect the most authentic figures are derived from the United States. In that country the National Health Survey has shown that 20% of all cases of uniocular blindness and 8% of all cases of blindness of both eyes are due to occupational injuries. The toll to national efficiency of industrial eye injuries in America is an annual loss of 53,760,000 man-hours, that is, the equivalent of 26,880 full-time employees each year. The total direct cost to industry — medical costs, lost time and compensation — comes to some $100,000,000 per annum, to which must be added an equivalent figure as the annual cost of loss of wages to the workman and the charge to his relatives or the community in relief—an annual total in the neighbourhood of $200,000,000.

The tragedy of it is that 95% of these accidents are preventable. Given adequate eye-testing, adequate illumination, adequate eye safety equipment, adequate knowledge of the substances with which we deal, and adequate emergency eye care, it would seem incredible to an informed and impartial observer that this astonishing waste in resources should be allowed to go on in any economically-minded community. Equally incredible is it that it should be tolerated in any humanitarian society. But so it is. If in Australia you are approaching the stage when you are going to take blindness seriously, a campaign against the unnecessary waste in resources and the unnecessary suffering thus entailed should not be forgotten.

Let us now turn to the diseases of the eye which take the greatest toll of blindness in advanced countries like ours—glaucoma and cataract. Both of these are attracting a considerable amount of research in many countries of the world; but both of them still present many problems still awaiting solution. We do not yet know the primary cause of glaucoma. We know in general that it is due to an increase in the pressure within the eye which, if it is allowed to continue without relief, paralyses the optic nerve so that blindness results, sometimes slowly and insidiously, sometimes suddenly and catastrophically. Many of us have ideas—most of them yet unproven—as to the cause. It seems probable that one form is due to a gradual failure of the circulation of the blood in the eye; and that another is essentially a stress-disease, due to a congestion of the circulation often brought about by anxiety, worry and overstrain. But there is no reason why research, if sufficiently concentrated and determined, should not elucidate this problem. It involves investigations into some of the ways of working of the normal eye about which we are yet ignorant, as well as some problems peculiar to the diseased eye; it is certainly a problem which invites and, indeed, demands research. It is a challenge presented to the investigator by the unknown and a social problem of no mean importance.

For the disease is a common one. It has been estimated in the United States that it affects 2% of the adult population over 40 years of age; a similar figure applies to Great Britain. Moreover, it is an insidious disease that comes on gradually without the victim's knowledge. In an American investigation 10,500 adults over 40 were examined, 280 were found to have glaucoma, and only 4 knew they had it. In 1950 the National Society for the Prevention of Blindness estimated that between 800,000 and 1,000,000 inhabitants of the U.S.A. were affected by glaucoma and did not know they had the disease.

The important thing to realize about glaucoma is this. It is a bilateral disease which in the absence of treatment tends to be progressive until it ends in total blindness. An investigation by two of your great surgeons, Ringland Anderson and Bruce Hamilton, covering 12,240 private patients in Victoria, and 6,770 patients in Tasmania, showed that glaucoma was responsible for 20% and 12% of blindness. It causes 14% of blindness of both eyes in England; and 11.6% in the United States. In England it is responsible for the total blindness of 13,000 people; in the U.S.A. there are 30,000 persons totally blind from this disease, and, in addition, 150,000 blind in one eye. Moreover, it causes an immense amount of disability short of blindness.

Although we do not yet know its cause, the prevention of blindness from glaucoma is largely in our own hands. For if it is recognized in its early stages, and adequate and sustained treatment is given, most cases—but unfortunately not all—can be checked and stabilized. Moreover, the methods of treatment—both medical and surgical—necessary to stabilize it are so much more simple and effective if instituted at the early stages than those required when the disease has become fully established that the prognosis is entirely transformed. When we remember all this, it is obvious how vitally important it is to impress upon the public the importance of this disease and to provide a mechanism for its early diagnosis and treatment.

At our Institute of Ophthalmology in London we are deeply engaged in the difficult but fascinating problem of trying to determine the causes of this disease, and for several years we have been running a research clinic to determine more accurate and certain methods of diagnosis and treatment in its early stages. I am more than delighted to know that one of the first schemes in your new

Institute will be the establishment of a similar clinic. It will be one of the potent factors in reducing the incidence of blindness in Victoria. Let us forget for a moment about the humanitarian aspects of the matter; let us be purely matter-of-fact. For every £1 you as a community spend on such a clinic you will save £100 in maintaining the efficiency of your working population and in saving the finance necessary to sustain the economically useless blind.

Cataract is the second major disease which takes its toll in blindness in this and every other advanced country. Again, we do not really know its cause: generally it comes with advancing age; most people over 65, and practically everyone at 75 years of age, have some cataract—many at a much earlier age. You need not be too alarmed at this, however, because as a rule its progress is so slow that most of us die without knowing we have it. Nevertheless, it causes an immense amount of disability. It is true that in most cases cataract can be removed by operation; but there is always some visual incapacity before the operation; and vision is never quite so plastic and adaptable after it.

But many cases are not suitable for operation and, indeed, of the registered blind in England 26% are due to cataract—that is, twice as many as are due to glaucoma. In countries not so advanced, such as much of Asia and Africa, where surgery is not readily available— or perhaps not available at all—cataract, of course, presents an enormous problem, producing a fantastic amount of blindness—fortunately for the most part affecting the aged.

Here then is a challenge for research. I suppose, biologically speaking, we should die when the reproductive age is past, say about 50—as indeed happened statistically not so many years ago. But if we are to persist in living longer, if the expectation of life is to creep upwards beyond 65 or 67, and more and more of us are to survive the 70's and enter the 80's, the problem of cataract becomes increasingly more important. In the eye there is a lens which focuses the light to form an image just as occurs in a camera. In cataract this lens goes opaque. The opacity is probably due to an asphyxiation of the lens; it ceases to absorb oxygen probably because the chemical processes on which this action depends fail. What we need is research into the biochemistry of the lens; and it may well be that instead of acting as mere surgical carpenters and operating as a last—and not always feasible—resort by removing the lens when it turns cloudy, some day in the future we, knowing the chemistry of its functioning, will be able to prevent the disease.

The remaining large class of diseases that cause blindness are the congenital disturbances. These are the more important as they usually affect the young, and they become a really formidable problem if they are assessed—as they should be economically—in terms of future years of blindness — a problem much more serious than the onset of blindness in the aged. It has often been said that much cannot be done about these conditions by research; but that is certainly not the case. To illustrate this I will give you two examples, in both of which Australia played an important and pioneering part.

In 1941 Norman Gregg, in Sydney, noticed that quite an unusual number of infants were being born with cataract and congenital deformities of the heart and other organs; and unfortunately the cataract so formed was difficult to operate on so that many of these children became blind for life. With unusual clinical insight—comparable in many ways to Fleming's discovery of penicillin—he discovered the cause of this catastrophe: by reason of that he is now Sir Norman Gregg. It was war-time, and around Sydney there was much congestion in military camps, together with all the usual industrial upheaval of war; as usually happens in these circumstances, infective diseases were prevalent. Calculating the times of birth of the affected infants, Gregg noticed that the incidence of these cataracts coincided with the incidence of an unusually severe epidemic of German measles (rubella) affecting mothers in the early months of pregnancy. It was a startlingly new conception that an infection in the mother could cause the development of cataract and other deformities in the child; and the matter was taken up with more than usual interest in hospitals all over the world. And it turned out to be true. Research has shown that treatment to a pregnant woman exposed to infection by German measles by convalescent serum will reduce the incidence of cataract very considerably; but the best way to solve the problem is by prophylaxis. Today the wise parent sees that his daughters get German measles and are thus done with it for life before they marry. Today in a girls' school in England the appearance of a girl with German measles is greeted with joy; instead of being isolated she at once becomes socially popular so that all may share her fortune and her subsequent immunity.

My second example is a condition generally called retrolental fibroplasia. It was noted to occur in prematurely born infants who were reared in hospital, first at the end of the 1930's in Boston, Mass. It occurred almost in epidemic form in all the advanced countries of the world; rarely if ever in children at home, and never in primitive countries without an elaborate hospital system. In it the retina became detached, the eye gradually filled with scar-tissue, and in advanced cases blindness eventually became bilateral, absolute, and irremediable — for treatment or operation was without effect. Obviously it was a very serious matter.

In England an assessment in 1954 showed that it represented much the largest single cause of blindness in infants, accounting for 206 cases, and the homes for blind children, a decade previously filled with half-blind babies, the victims of venereal disease, and now almost empty, rapidly began filling again with completely blind infants, the victims of retrolental fibroplasia.

At the same date in the U.S.A., 8,000 infants were known to be blinded from this cause. In Australia, perhaps because of a certain Dr. Kate Campbell, only some 30 infants were blinded.

For, first in this City of Melbourne, Dr. Kate Campbell noted that this calamitous condition coincided with the lavish use of oxygen in the resuscitation of these premature babies. A host of other suggestions was made; but the disease increased in its incidence. But, unfortunately, Kate Campbell had no Research Institute of Ophthalmology to pursue her idea. It was, however, taken up in London at our Institute of Ophthalmology; and there Ashton first proved conclusively by inducing the disease in kittens which, as you know, are born with half-formed eyes, that oxygen was indeed the cause.

Because of this piece of research, carried out in London and amply confirmed in the United States, the administration of oxygen to such infants is now restricted to the safe concentration of 30% and the disease has completely disappeared. Never in the history of the world has a disease appeared so suddenly, done so much damage, and then been so completely abolished. It is an epic of the value of organized research in medicine.

Again, forget about the humanitarian aspect of the matter.

Forget the tragedy of a baby born blind and condemned to a lifetime of blindness. Forget the anguish of the parents; the grief of all who are to share his life with him. But remember one thing only. The cost to Australia of its 30 blind babies will be in the region of £1,000,000. The cost to the U.S.A. of their 8,000 has been estimated at $800 million. And the cause was proved and preventative measures detailed in our Institute of Ophthalmology by the expenditure of a Government grant of £530 through our Medical Research Council—a sum representing a year or two of the blind pension of a single sufferer. Surely a good investment—even if considered only in monetary terms. It is greatly to be hoped that your Government will be equally prudent in its investments.

Let us now turn for a moment to glance at the position in the less advanced countries. Unfortunately these still include the greatest number of human beings. Here the same blinding diseases occur as in our own; but the position is much aggravated by other factors, many of them more social than strictly medical in nature. Ignorance, dirt, and squalor prevail, with a complete lack of hygiene and a pitiful lack of trained personnel to bring help. Hundreds of millions live in conditions wherein blindness is but one aspect of a general picture in which ill-health and widespread disease are rampant. The main causes are malnutrition and under-nourishment on the one hand, and infective diseases on the other. Of the latter, the acute purulent infections, trachoma and onchocerciasis, take pride of place.

The first—purulent infections—is largely a question of dirt and ignorance and unhygienic living; its prevention is a matter or social policy and raising the standard of living. The most effective single measure is the use of ordinary soap and water. The latter two diseases, however, are interesting medical problems.

Onchocerciasis fortunately does not affect Australia; but it is of widespread occurrence in Central America and over wide tracts of Central and Western Africa. It is caused by a minute worm carried to human beings by a lymph-sucking fly; and blindness is caused by the invasion of the eyes by innumerable hordes of the worm. The ravages caused by this worm are quite unbelievable. The fly breeds in running water and the condition is thus limited to the neighbourhood of streams; for this reason it is called "River Blindness" by the African natives. Near those streams in heavily infected areas we find villages wherein every adult is blind. In these villages children are precious things, for they alone can see to lead about their elders for a few years until they themselves turn blind.

I am particularly interested in this disease because an intensive campaign is being conducted against it by the British Empire Society for the Blind. We have just had a survey done of large areas of Africa. We have not yet found a satisfactory drug to kill off the offending worm; but the prevention of the disease is perfectly possible by the entomological methods required to kill off the fly.

Incidentally, you may be interested to know that a month or two ago the British Empire Society for the Blind has changed its name into the British Commonwealth Society for the Blind so that the Commonwealth countries can become associated with us in the work we are doing. Canada has already done so. Let us hope Australia will join also; and that its medical headquarters will be the new unit for the Prevention of Blindness in Melbourne, just as the medical headquarters of the main society is my Institute in London.

Trachoma is an even larger problem, and is nearer to you because it affects Australia, not only at home, but in its dependent territories in the Pacific. Some years ago the World Health Organization estimated that it affected $\frac{1}{4}$ of all the inhabitants of the world. It stretches in a belt from Central and South America across to Northern and Central Africa and Southern and Eastern Europe. In large areas in Northern Africa, Egypt, and parts of Tunis and Algeria, trachoma affects over 90% of the native population. In the Middle East its incidence is similarly high. The infections extend through Iraq and Persia and into India. In parts of India the incidence is also distressingly high. We know little of what is happening today in China; but before the war it was estimated that 100,000,000 Chinese had trachoma, that 5,000,000 were blind in one eye, and over 2,000,000 were blind in both eyes because of it. In Japan and Indonesia the infection is also high, as it is throughout the Pacific; in Fiji, for example, some 90% of the natives are infected. Trachoma was a major cause of blindness in Victoria a generation ago; it caused 3.6% of blindness among private patients in Victoria and 2.5% in Tasmania in 1939; but today it is rarely seen. Nevertheless, the fascinating journeys and studies of Ida Mann have shown that today it is unsuspectedly prevalent in this country, particularly among the native population. She has found that it affects 62% of the patients with diseases of the eye in the Kimberleys, 64% in south-west Australia, and 80% in New Guinea. It is therefore a problem of considerable importance to you in your own home.

It is to be remembered that trachoma in its pure form is often not incapacitating; but in many parts of the world complicating infections make it the cause of more blindness and incapacity than any other disease on earth. Moreover, apart altogether from the humanitarian aspects, its sequelae may cause a life-time of discomfort, often of constant pain, and too often of blindness. In addition, its economic effects are catastrophic. To give you one example: WHO took a census in Tunis in 1953. Tunis, you will remember, is a relatively small country predominantly rural in type with a total population of 3½ million; nevertheless, in that single year, taking the adult working population only, WHO estimated that 25,000,000 working days were lost to industry in that country. Multiply that throughout the millions of sufferers from trachoma all over the world and you will gain some idea of the economic loss which results. If a world conscience does not yet exist in such matters, one would think that considerations of pure economics would stimulate a concentrated effort to elucidate the cause of this disease and seek out methods to eliminate it; but this is not yet the case.

It is generally believed that trachoma is caused by a virus; but the whole problem of its aetiology has never been adequately proved. The virus has never been conclusively grown and isolated. It is true that much of the ravages of trachoma can be eliminated by the use of antibiotic drugs; that has been shown by the campaigns undertaken by WHO in North Africa and Southern Europe; and nearer home by Professor Mann here in Australia. In many cases which have not progressed too far the disastrous complications of trachoma can be prevented in this way; in most cases trachoma can thus be converted into a relatively quiet and fairly innocuous disease. In many cases it would seem to be curable, although in most parts of the world, particularly in the Middle East, quite a large proportion of cases are resistant to treatment. Research is required to isolate the virus and devise more effective methods of treatment, by drugs, by vaccination, or by other means.

We are attempting this in London in association with research work in the Ophthalmic Hospital of St. John in Jerusalem and the M.R.C. laboratories in Gambia. But so far nothing pragmatic has emerged in the way of results. This is a tremendous field for research for the future.

That, then, is the general position of blindness here and in the world in general. That is what is being done to prevent it. What more should we do? What should we do in our own interests—for each of us may go blind, from cataract or glaucoma or another disease. What should we do in the interests of those others, numbered in millions, less fortunate than us who are in no position to help themselves?

It may be of interest to you to know what approximately is the position today in England. In Britain we spend a very considerable amount on medical research. The Government through the M.R.C. alone spend over £15 million per annum on medical research apart from the amount spent by the Hospitals and the Universities; but the amount of money spent on eye diseases and research on the prevention of blindness is a relatively small fraction of that total. We have actively organized research in eye disease in 6 main institutions: Edinburgh, Glasgow, Manchester, Oxford, Birmingham, and two in London. The largest is the University Institute in London; and there our budget is £150,000 per annum. On the whole, the annual amount expended on eye research is probably in the neighbourhood of £¼ million.

This may seem much; but the other side of the ledger is much larger—the amount of money spent on maintaining the blind. In England the direct financial outlay by the Central Government as national assistance and pensions and supplementation of insurance benefits amounts to £6½ million. The charge on local government authorities for welfare services to the blind for the year ended March 31st, 1956, was £1,880,000. Special educational services cost them another £150,000; that is, a total of £2 million. In addition to official sources, in helping, educating and rehabilitating the blind, there are a number of voluntary sources. Among them the Royal National Institute for the Blind alone spends £800,000 p.a. It is true that much of this is recoverable to the Institute from Government Departments, the public and the blind themselves; but nevertheless it is spent. In addition, there are over 100 local voluntary bodies distributed over the country which expend a total of about £250,000 each year. The total official cost of the blind in England is therefore £9½ million p.a. The cost to individuals apart from this official help must be as great. The indirect cost of loss of production to the community must be as great again. In all it would probably be an underestimate to say that the bill for blindness to the total economy runs to over £30 million p.a. And most of it is preventable—or potentially so. The tragedy is that we are only spending £¼ million to save £30 million; that is, an outlay of 0.8% for preventative purposes. It is certainly all out of proportion.

In the U.S.A. the figures are comparable. It is estimated that there were spent in the year 1955 in tax and private funds some $150,000,000 for care and services to the blind. As a gross underestimate we can put the loss to the community in supporting them at as much again to make the figure $300,000,000. Add to this the industrial loss in accidents involving the eyes of $200,000,000, and we get a total loss to the economy of $500,000,000.

And what are the Americans doing to prevent this? They are doing a great deal—more in actual figures than we are doing in England, more, indeed, than in any country of the world; but in proportion less than we expend in England. Last year, 1956, the American Government, through the National Institutes of the Public Health Service, allocated $1,531,335 for laboratory and clinical research in eye diseases and spent $526,260 on training grants to young eye surgeons in research techniques and methods—a total expenditure on research against blindness for the year of $2,057,595. In addition to this, government expenditure, in the U.S.A. another $1,200,000 were spent on research by the Medical Schools, the great Foundations, and such voluntary bodies as the National Society for the Prevention of Blindness and the National Council to Combat Blindness. This makes a grand total of $3¼ million—quite a large figure. In 1950 the Americans spent less than $1 million on research. In 1955 it was $1,770,000; last year $3¼ million, and the allocation this year is greater. This is a great material effort — as we would expect, greater than is attempted by any nation in the world—but remember that, even so, they are only spending $3¼ million in an attempt to prevent an annual loss of $500 million, that is, an outlay of 0.7% for preventative purposes. Again, the whole thing is out of proportion when we remember the vast savings in the bill for blindness that research has already made; when we remember that there is every reason to suppose that, given adequate research, much more could again be saved.

And now you in Australia are starting a new epoch by embarking on organized research in the prevention of blindness yourselves. It is something really worth while. Make it something to be proud of—the best of its kind in the world. I am told that, although it is starting in Victoria, it is not to be the affair of Victoria alone, but of the entire Commonwealth. Personally, I do not think that is good enough.

In our Institute in London we have an average of 100 students per year; and of these about 25% come from the British Isles and 75% come from abroad. Many of them from the Commonwealth, some of them from Europe, some from South America, a large number from Africa and the Middle East, and from India, Siam and further East. But surely for you in Australia there is a challenge here. Why should your Institute for the Prevention of Blindness not be the centre for research in Eye Diseases—not for Victoria, not for Australia, but for the Islands of the Pacific and the countries of South-East Asia? If Australia is not to be the intellectual and scientific leader of this great quadrant of the globe, who is to be? The Japanese tomorrow? The Chinese The Day after tomorrow? What an opportunity you have if you will seize it; an opportunity untainted by Imperialism or colonialism, of pure humanitarianism and altruism. Make it an Australasian Institute for The Prevention of Blindness in the widest and the greatest sense.

Seize this opportunity while there is yet time. Give it all the public support and Governmental aid you can muster.

Might I make a suggestion? Add up the total bill that blindness costs you. Start where we in Great Britain and the Americans will probably be tomorrow, and spend a mere 1.0% of this in order to save a great proportion of this total. Then add to that sufficient to make you the leaders in your quarter of the world.

For it will be worth your while; worthwhile because the finding out of new things, of being alive, of being a spearhead in world progress is always great fun. Today, for you, it will be fun. Tomorrow, in a country which will be numbered among the great ones of the earth, it will be a duty. And it is only thus that you will be so numbered.

Moreover, it will be worthwhile, because you can be assured that your endeavours will pay dividends in increasing the happiness and efficiency and health of your own community, such as is offered by few projects. At the lowest assessment—speaking as a Scotchman to Australians—it will be worthwhile because it will be a soundly paying financial investment; but to you will be added a greater thing than that—the knowledge and the realization that you are decreasing suffering and incapacity, and increasing happiness and efficiency. For in this way does a people find its soul.

I have told you how in England our special hospitals for infectious diseases of children's eyes are now standing empty because of research. I have told you how, because of research, our elaborate and costly arrangements for the visual care of prematurely born blind babies are now no longer required. In the same way our sanatoria, crammed to overflowing with tuberculous patients during and after the war and planned to be vastly extended, are now rapidly emptying because of research. It is curious how we always do things the wrong way round. Do not do that in Australia. Be bold! and have faith! Do not build elaborate and permanent homes for the blind in this country. But instead, build a splendid and permanent laboratory for research and a temporary prefab. for the blind—but at the same time make it warm and comfortable.

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